Ibuprofen or Acetaminophen?

Hypothesis:

\( H_0 \): There is no difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

\( H_a \): There is a difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

Assess Conditions:

- **Random** The treatments were assigned at random.
- **Large Sample Size** The expected counts (listed below) are all at least 5.

<table>
<thead>
<tr>
<th></th>
<th>Ibuprofen</th>
<th>Acetaminophen plus Codeine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse effects</td>
<td>48.5</td>
<td>44.5</td>
</tr>
<tr>
<td>No adverse effects</td>
<td>73.5</td>
<td>67.5</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>112</td>
</tr>
</tbody>
</table>

- **Independent** Knowing if one subject had an adverse effect shouldn’t give any additional information about the responses of other subjects, so the observations can be considered independent.

Name the Test: Chi-square test for homogeneity.

Test Statistic: \( \chi^2 = \sum \frac{(O - E)^2}{E} = 11.15, \text{df} = 1 \)

Obtain P-value: p-value: \( = 0.0008 \).

Make a Decision: Because the P-value of 0.0008 is less than \( \alpha = 0.05 \), we reject \( H_0 \).

State the Conclusion: We have convincing evidence that there is a difference in the proportions of patients like these who suffer adverse effects when taking ibuprofen or acetaminophen plus codeine.

Tide vs. New Tide?

Hypothesis:

\( H_0 \): There is no association between type of wash and support for the new product among people who don’t use the established brand

\( H_a \): There is an association between type of wash and support for the new product among people who don’t use the established brand

Assess Conditions:

Random: The data came from a random sample.

Large sample size: All counts are greater than 5 as evident in the table below.

<table>
<thead>
<tr>
<th>Product preference</th>
<th>Soft. warm</th>
<th>Soft. hot</th>
<th>Hard. warm</th>
<th>Hard. hot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>49.81</td>
<td>24.05</td>
<td>47.23</td>
<td>30.92</td>
</tr>
<tr>
<td>New</td>
<td>66.19</td>
<td>31.95</td>
<td>62.77</td>
<td>41.08</td>
</tr>
</tbody>
</table>

Independent: Our sample includes 354 people. This is less than 10% of the population of the US who don’t currently use the established brand.
Name the Test: Chi-Square test for association/independence

Test Statistic: $x^2 = 2.058$, df = 3

Obtain p-value: p-value = 0.5605

Make a Decision: Since the P-value of 0.5605 is greater than 0.05, we fail to reject the null hypothesis.

State the Conclusion: We do not have enough evidence to say that there is an association between type of wash and support for the new product among people who don’t use the established brand.